

PROJECT PLAN
FOR
RECONSTRUCTION WORK IN CENTRAL AMERICA
GUATEMALA

PHASE I
OCTOBER 1, 1999 – SEPTEMBER 30, 2000
AND
PHASE II
OCTOBER 1, 2000 – DECEMBER 31, 2001

AUGUST 2000

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
U.S. National Weather Service

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I. INTRODUCTION

This Project Plan focuses on activities to be accomplished by the Department of Commerce, National Oceanic and Atmospheric Administration, U.S. National Weather Service (hereafter, NWS) for the period through December 31, 2001. This plan supersedes the Phase I Project Plan dated November 1999 since the activities described in that plan have been updated based on further evaluations and meetings with counterpart agencies.

A. Background

Hurricane Mitch was one of the most powerful and destructive hurricanes to affect Central America. The late October 1998 storm impacted most of the Central America countries, with most damages and losses due to flooding and mudslides from the torrential rains that fell throughout the region. Specific impacts in Guatemala were as follows.

Number of people killed:	268
Number of people missing:	121
Number of victims/people injured:	55,005
Number of people evacuated:	105,000
Number of homes destroyed/severely damaged:	2,294
Number of moderately damaged homes:	19,450
Number of bridges destroyed:	121

Total damages are estimated at US\$66.6 Million. In all, approximately 6.3 % of the population was affected by the storm.

In addition to the destruction to the economic and social infrastructure by Hurricane Mitch, important portions of the hydrometeorological monitoring network, equipment instrumental in the monitoring and forecasting of these type of events, were also damaged or destroyed.

B. Purpose of the Project Plan

The purpose of this plan is to document the activities to be performed by the Department of Commerce, National Oceanic and Atmospheric Administration, U.S. National Weather Service (hereafter, NWS) under the Interagency Agreement (IAA) signed on September 14, 1999. The IAA is between the Department of Commerce (DoC) and the U.S. Agency for International Development (USAID) defining reconstruction work in Central America (Hurricane Mitch) and the Caribbean (Hurricane Georges). The IAA incorporates in full the U.S. Department of Commerce's *Implementation Plan for Reconstruction Work in Central America*, July 1999. This Project Plan will address the activities proposed in the DoC Plan and will discuss the problems and issues, objectives, management approach, coordination of activities and applications to other project plans for the reconstruction program.

The focus of the NWS Project Plan is for reconstruction and expansion of hydrometeorological monitoring networks (where appropriate) and the development of early warning systems for weather-related natural disasters (focusing on floods) through provision of technology, technical support and capacity building (training). This Project Plan does not discuss activities to the detail of a work plan but provides specifics as to implementation approaches and presents an overall schedule.

I. STATEMENT OF PROBLEMS AND ISSUES

Significant problems regarding the adequacy of hydrometeorological monitoring and forecasting capabilities were uncovered during Hurricane Mitch in Guatemala. The existing forecasting (hydrologic and meteorological) and near-real-time hydrometeorological monitoring capacity proved insufficient during the event and impacted on the GOG abilities to properly warn impacted and potentially-impacted areas. In addition, the GOG has minimal early warning system capability for significant weather-related events. Local “flood warning systems” exists in the southwest area of the country and systems are planned for the Madre Vieja and Samala basins in 1999. These systems are rudimentary, relying on radio transmissions by local observers.

However, the problems with the hydrometeorological monitoring network were evident before Hurricane Mitch as the existing system had insufficient areal coverage, obsolete equipment, and poor to non-existent maintenance. A big concern of the GOG is the inefficient collection and management of data from the monitoring networks as none of the stations are automated. Hurricane Mitch has made a bad situation worse by destroying or damaging 10 meteorological monitoring, 10 river gaging and two radio repeater stations (used in the transmission of hydrometeorological data).

Consequently, the NWS program in Guatemala will address activities needed to rebuild capacity for forecasting and early warning capabilities specifically in the following problem areas – 1) Base Infrastructure Reconstruction, 2) Forecast and Early Warning Systems, and 3) Disaster Preparedness and Response. Activities for each of these problem areas were defined through workshops and meetings with the GOG counterpart agencies, meetings with local non-governmental organizations (NGOs) and private volunteer organizations (PVOs) and with the USAID mission in Guatemala. In defining the program for Guatemala, the NWS also considered the needs and requirements outlined in a report compiled jointly by the GOG and the World Meteorological Organization entitled *Support of Natural Disaster Prevention and Water Resources Management, Transformation of National Meteorological and Hydrological Services Affected by Hurricane Mitch*, June 1999.

The NWS program in Guatemala is consistent with the USAID/Guatemala Mission Special Objectives Document (SpO), *Rural Economy Recovers from Mitch and is Less Vulnerable to Disasters*. These activities specifically address *Intermediate Result 1* of the SpO, (*Disaster Preparedness Enhanced*) by implementing flood early warning systems in Guatemala.

II. PROJECT OBJECTIVES

Consistent with the DoC *Implementation Plan for Reconstruction Work in Central America*, the NWS will address the following defined problem areas for Guatemala – 1) Base Infrastructure, 2) Forecast and Early Warning Systems, and 3) Disaster Preparedness and Response. For each area, activities are defined which focus on reconstruction and expansion of hydrometeorological monitoring networks and the development of early warning systems for weather-related natural disasters (focusing on floods) through provision of technology, technical support and capacity building (training). The NWS activities will be designed in coordination with activities defined by other U.S. Government organizations including the DOC and USGS (see Chapter III, Section B of this Plan).

A. NWS Activities

The NWS Phase I activities are identified in Table 1. These activities are to be completed by September 30, 2000. The NWS Phase II activities are identified in Table 2. These activities will be completed by December 31, 2001. The level of effort for each activity in Phase II (e.g., number of hydrometeorological monitoring stations or radios installed) is contingent on actual costs to implement and unforeseen problems.

An important aspect in the development of this plan is the identification of the appropriate GOG counterpart agencies to which this technology will be transferred. GOG primary counterpart agencies for the NWS in the implementation of these activities are defined as follows. Where applicable these counterpart agencies are referenced in the Table 1 for specific activities.

- **INSIVUMEH** – the *National Institute of Seismology, Vulcanology, Meteorology and, Hydrology* located under the *Ministry of Communications, Transportation, Public Works and Housing*. Responsible for the collection, analysis and distribution of environmental data.
- **CONRED** – the *National Coordinating Agency for Disaster Reduction*, specialized agency for handling emergencies and disaster relief. CONRED is responsible for developing mechanisms and procedures for reducing disasters as well as manage disaster events in coordination with mayors of municipalities and department governors.

The NWS will also work closely with local NGOs (e.g., CRS) where needed especially with the design and implementation of community-based emergency systems.

NWS contractors will perform most of the implementation tasks. The NWS, with its contractors, will provide complete installation and check out of all hardware and software.

Counterpart agency resource commitment will be limited to training activities including training provided during installation and implementation. Some training may be required in the United States. Continued counterpart agency support will also be needed during planning meetings.

Table 1. NWS Activities for Phase I (through September 30, 2000) - Guatemala			
Problem Area	Activities	Description	Location
Base Infrastructure Reconstruction	Reconstruct and Improve Hydrometeorological Data Collection Networks	1) Install automatic weather stations (data collection platforms – UHF, cell phone, dial-up phone transmission, satellite backup) at existing synoptic observing locations (stations to measure wind speed and direction, ambient temperature, humidity, precipitation, atmospheric pressure, evaporation and insolation) – INSIVUMEH	Puerto San Jose, Retalhuelu, Huehuetenango
		2) Upgrade telecommunications networks by purchasing one new repeater station, three radio base stations, and four VHF radios to transmit hydrometeorological data from observation networks (no installation) – INSIVUMEH	Eastern Guatemala – Río Lempa watershed; Guatemala City
		3) Deliver (no installation) ten (10) basic weather stations (wind speed and direction, temperature, precipitation) – INSIVUMEH	Guatemala City (to be installed by INSIVUMEH at existing synoptic stations)
Forecast and Early Warning Systems	Implementation of community-based flood warning systems	1) Design one automated flood early warning system, including forecast capability. System comprised of streamflow and precipitation Data Collection Platforms and PC base stations. – INSIVUMEH, CONRED	Río Polochic

Table 1. NWS Activities for Phase I (through September 30, 2000) - Guatemala			
Problem Area	Activities	Description	Location
Forecast and Early Warning Systems	Training and Capacity Building	2) One meteorologist and one hydrologist for post graduate training in operational meteorology and hydrology at the University of Costa Rica – INSIVUMEH	San Jose, Costa Rica
Disaster Preparedness and Response	Training and capacity building	1) Installation, operation, maintenance, and quality control training on NOAA systems for maintenance personnel – INSIVUMEH	Guatemala City
		2) One meteorologist trained at the International Forecasting Desk at the National Centers for Environmental Prediction – INSIVUMEH	Washington, D.C.
		3) Develop concept of operation procedures corresponding to implementation of flood early warning system – CONRED, INSIVUMEH	Guatemala City
		4) Operation training of PC base station hardware and software for automatic weather stations – INSIVUMEH	Guatemala City, Puerto San Jose, Retalhuelu, Huehuetenango

Table 2. NWS Activities for Phase II (October 1, 2000 – December 31, 2001) - Guatemala			
Problem Area	Activities	Description	Location
Base Infrastructure Reconstruction	Reconstruct and Improve Hydrometeorological Data Collection Networks	1) Install automatic weather stations (data collection platforms – UHF, cell phone, dial-up phone transmission, satellite backup) at existing synoptic observing locations (stations to measure wind speed and direction, ambient temperature, humidity, precipitation, atmospheric pressure, evaporation and insolation) – INSIVUMEH	Two locations (to be determined based on INSIVUMEH priorities)
		2) Purchase and installation of office personal computers, as needed – INSIVUMEH	Guatemala City
		3) Provide spare parts and test equipment, as needed – INSIVUMEH	Guatemala City
		4) Maintenance of NOAA-installed systems, including flood warning systems, as needed – INSIVUMEH	Field sites
Forecast and Early Warning Systems	Implementation of community-based flood warning systems	1) Implement one automated flood early warning system, including forecast capability. System comprised of streamflow and precipitation Data Collection Platforms and PC base stations (stream gages will be installed by NOAA, not by USGS). – INSIVUMEH, CONRED	Río Polochic

Table 2. NWS Activities for Phase II (October 1, 2000 – December 31, 2001) - Guatemala			
Problem Area	Activities	Description	Location
Forecast and Early Warning Systems	Flood early warning systems	2) Install automatic precipitation stations on volcanoes for flood early warning capability – INSIVUMEH, CONRED	Two high priority locations in Southern Guatemala (site selection not complete)
	National Strategic Implementation Plan	3) Assist with development of short (2-5 years) and long range (5-10 years) plans for strengthening the agency, developing budget strategies and sustaining the new technologies. This plan will include development of equipment maintenance budgets – INSIVUMEH	Guatemala City
	Training and Capacity Building	3) Installation, operation, maintenance, and quality control training on newly installed NOAA systems for maintenance personnel – INSIVUMEH	Automatic weather stations (locations to be determined), flood warning systems for Río Polochic and southern volcanoes
		4) Operation training of PC base station hardware and software for automatic weather stations – INSIVUMEH	Automatic weather stations (locations to be determined)
Disaster Preparedness and Response	Training and capacity building	1) Operation training of PC base station hardware and software for flood warning and forecast system – INSIVUMEH, CONRED, Community, Observers	Guatemala City
		2) Hydrologic forecast training using software for the flood warning system – INSIVUMEH, CONRED	Guatemala City

Table 2. NWS Activities for Phase II (October 1, 2000 – December 31, 2001) - Guatemala			
Problem Area	Activities	Description	Location
Disaster Preparedness and Response	Training and capacity building	3) Operation training of PC base station hardware and software for automatic weather stations for new stations and as, needed for existing stations – INSIVUMEH	New stations, Guatemala City, Puerto San Jose, Retalhuelu, Huehuetenango
		4) One meteorologist (second trainee) trained at the International Forecasting Desk at the National Centers for Environmental Prediction – INSIVUMEH	Washington, D.C.
		5) Advanced training for one meteorological technician at the University of Costa Rica, as needed and contingent on funding	San Jose, Costa Rica

In addition to the training noted in Table 1, INSIVUMEH personnel will be attending a flood forecasting workshop in the United States (see Activity Schedule in Section V of this plan). Funding for INSIVUMEH attendance at this workshop will be from the NOAA regional supplemental program budget (regional workshop budgets), not from the NOAA Guatemala program budget. One INSIVUMEH meteorologist/hydrologist will also be attending a joint World Meteorological Organization and NOAA sponsored hydrological forecasting course in the United States in October 2000. The costs for this course will also come from the NOAA regional supplemental program budget.

The community-based flood early warning system for the Río Polochic will be designed to include the following capabilities.

- Streamflow and precipitation gages sited and installed at upstream locations to measure conditions indicating flooding potential at key municipalities. (This will be accomplished in coordination with USGS.)
- Data from these measuring stations will be sent to PC base stations located in a selected municipality (in a 24 hour a day operational location such as a fire or police station or a location with a 24-hour observer system such as supplied by INSIVUMEH), and to INSIVUMEH then CONRED via radio or satellite.
- Software in the base stations can be used trigger initial warning alarms in the municipality and other downstream locations (e.g., other municipalities or pueblos). Procedures will be developed to inform the population what this initial warning means and what action to take. Alarms will also be triggered at each base station (e.g., flashing screens).
- Base station displays to permit operators to evaluate the event, look at hydrologic model output for forecasts, evaluate the meteorological situation and determine whether to issue evacuation orders.
- The final concept of operations will be developed in coordination with INSIVUMEH and CONRED.

The synoptic weather measurement network will be upgraded with automatic weather stations, replacing the malfunctioning, antiquated measurement equipment currently in use. The synoptic network was selected as the first priority because of its importance in weather nowcasting and forecasting and early warning activities. The synoptic network telecommunications system will consist of data collection platforms transmitting automatically and manually (by observers) collected data and observations via UHF radio and cell phone modem to INSIVUMEH in Guatemala City. The automatic weather stations will collect data for wind speed and direction, ambient temperature, humidity, precipitation, atmospheric pressure, evaporation, and insolation. Each site will have a personal computer base station. Satellite communications will be provided as a backup.

All training will be conducted in Spanish and all documentation (e.g., training materials, and user guides) will be provided in Spanish.

A. Coordination of Activities

The NWS activities will be performed in coordination with activities by USAID, other USG agencies, and other donors. This will be done to eliminate overlap and redundancy as much as possible. Table 3 summarizes the activities to be coordinated in Guatemala.

Table 3. Agency Coordination	
Organization	Activities to be Coordinated
NOAA – National Ocean Service	Installation of meteorological sensors on tide gages and at Continuously Operating Reference Sites (for GPS), where applicable
NOAA – National Environmental, Satellite, Data, and Information Service	Implementation of one kilometer resolution satellite imagery capability – coordination of imagery processing hardware and software within counterpart agencies
NOAA – Office of Global Programs	Implementation of climate forecasting capability within counterpart agencies
U. S. Geological Survey	Installation of streamflow gages – coordinate needs for flood early warning systems and co-located meteorological measurements instrumentation; coordinate INTERNET needs and capability requirements
Federal Emergency Management Agency	Coordination on the development of emergency plans to support implementation of flood warning systems and coordination with emergency operations center management.
USAID – Guatemala Mission	Coordination with implementing NGOs on disaster preparedness and management planning
USAID – GCAP	Coordination on the implementation of a river and flood forecast system for the Rio Lempa including installation of streamflow gages (in coordination with the U.S. Geological Survey), densification of the precipitation monitoring network, and integration of flood early warning systems (part of the Río Lempa watershed is in Guatemala)
USAID – OFDA	Coordination with the disaster preparedness assessment and recommended actions, as applicable
Atmospheric Environment – Canada	Coordination with base infrastructure reconstruction and flood early warning system activities to include hardware installation and maintenance
World Bank	Coordination on program expansion, maintenance and sustainability issues
Inter-American Development Bank	Coordination on program expansion, maintenance and sustainability issues
World Meteorological Organization	Coordination on long term program planning

A. Applicability to Other Plans

The NWS program in Guatemala is consistent with the needs and requirements outlined in the following, applicable plans and/or reports.

- U.S. Department of Commerce’s Implementation Plan for Reconstruction Work in Central America, U.S. Department of Commerce, July 1999
- Project Plan For Reconstruction Work in Central America, Guatemala, Phase I, November 1999
- Project Proposal, Support to Natural Disaster Prevention and Water Resources Management, Modernization of National Meteorological and Hydrological Services Affected by Hurricane Mitch – Guatemala, World Meteorological Organization, June 1999
- Special Objective Document, Rural Economy Recovers from Mitch and is Less Vulnerable to Disasters, USAID/Guatemala, April 1999
- Regional Project Plans, NOAA, November 1999

IV. MANAGEMENT PLAN

A. NWS Management Structure and Responsibilities

The NWS will provide a management structure to ensure the Guatemala program meets all USAID requirements and commitments. The NWS managers directly responsible for this project include the NWS Project Manager and the Guatemala Country Manager. Their responsibilities are as follows.

NWS Project Manager

- Develop and track project schedules and budgets
- Develop overall technical approach and tasks for each country and the region
- Develop country and regional work plans including a detailed cost plan
- Attend program meetings as required by NOAA management and USAID
- Coordinate local and in-country technical advisors, as appropriate
- Work with the NOAA Program Manager to coordinate activities and integrate tasks with other USG agencies
- Address line office, NOAA/DoC and USAID administrative requirements, including reporting requirements
- Provide input to the NOAA Program Manager for the NOAA quarterly progress report due to USAID
- Coordinate Country and Regional Managers and activities, as appropriate
- Coordinate activities with other NOAA line offices
- Develop contractor Statements of Work and Coordination of contractor activities with the NOAA Program Administrator
- Coordinate activities (including country clearances) with the NOAA Program Manager, USAID in-country missions and USAID/Washington program coordinators, as appropriate
- Coordinate with the NOAA Program Manager and the Guatemala Country Manager for additional, future donor support for appropriate project tasks

Guatemala Country Manager

- Coordinate all country-specific technical tasks
- Track schedules and budgets
- Coordinate all Guatemala activities with the line office project manager, Guatemala USAID mission, counterpart GOG agencies, other USG agencies and any technical advisors and coordinators in Guatemala
- Assist the NWS project manager with the development of a project plan for NWS activities in Guatemala and with administrative and reporting requirements
- Coordinate NOAA/NWS contractor activities in Guatemala
- Coordinate shipping of equipment with the Guatemala USAID mission

- Address personnel safety and security issues with in-field personnel (contractor and government personnel) and the Guatemala USAID missions
- Coordinate activities and requirements with Guatemala Private Volunteer Organizations and Non-Governmental Organizations (NGOs), e.g. development of disaster preparedness/management plans
- Work with the INSIVUMEH to develop short- and long-term strategic plans
- Work with other donors, including USAID, to expand and extend the implemented programs

A. NWS Contact Information

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B. Guatemala USAID Mission Assistance

It is understood that the USAID Guatemala Mission will be the focal point for all NWS activities in the country. This includes acting as the liaison between NWS, its contractors and the appropriate GOG counterpart agencies. Accordingly, the USAID Guatemala Mission will need to assist the NWS Guatemala Country Manager with the following, at a minimum.

- All in-country activities involving the NWS and its contractors including organizing meetings with and support from counterpart agencies, PVOs and NGOs and arranging for translators, if needed
- Country clearances for the NWS and its contractors
- Shipping and storage of equipment into Guatemala
- Development of Memoranda of Understanding between NOAA and GOG counterpart agencies
- Obtaining office work space, as needed

A. Measures of Progress

Measures of Progress and Measures of Effectiveness for each of the Problem Areas and activities have been defined in the DoC *Implementation Plan for Reconstruction Work in Central America*. The Measures of Progress are all activity outputs based on successful implementation of the defined activity. The DoC Quarterly Reports will also track progress for the various activities.

B. Program Sustainability

The NWS will work with the Guatemala USAID Mission, GOG counterpart agencies and other donors to develop a long-term strategy for expanding and sustaining the programs implemented. As discussed earlier, the NWS will initially develop routine maintenance costs for the proposed hardware and software to be installed and then work with the GOG counterpart agencies to ensure that appropriate budgets are defined to sustain these systems. If the budget is beyond the capabilities of the agency, the program will be revised accordingly. The NWS will also hold discussions with donors and Central America regional agencies to determine best approaches to sustain these programs. A separate activity to look at regionalization of certain hardware and software maintenance needs and requirements is provided for in the DoC regional program.

C. Equipment Turnover

After successful installation and checkout, all hardware will be formally turned over to the GOG. This will be accomplished per any appropriate Guatemala USAID Mission requirements. The GOG will assume all maintenance responsibility once the equipment is turned over. NOAA will perform maintenance (other than routine, preventive maintenance) through 31 December 2001.

I. SCHEDULE AND BUDGET

Although this plan focuses on activities to take place subsequent to the execution of the IAA between DoC and USAID, the NWS did perform some preliminary activities in order to be prepared to begin the program defined in the July 1999 DoC implementation plan. These preliminary activities included visits to Guatemala to meet with the USAID mission and with the counterpart GOG agencies to begin the planning process. Some visits included field trips to areas where programs will be implemented. Constant dialogue was maintained with Guatemala USAID mission and, to some degree, with the counterpart agencies, as these project plans were being developed.

A. Schedule

An implementation schedule for the entire program (beginning with preliminary activities in the second quarter of FY99 and running through September 2000) is provided in the following table. Schedule priority has been given to those activities most crucial to protecting lives and property, most notably installation of flood early warning systems and components.

Table 4. Program Schedule	
Installation, Operational or Implementation Date	Activity
By 30 September 2000	<p>3 – Automatic Weather Stations (Puerto San Jose, Retalhuelu, Huehuetenango)</p> <p>1 – Repeater station (for Eastern Guatemala, Río Lempa watershed)</p> <p>3 – Radio base stations and 4 UHF radios (for Eastern Guatemala – Río Lempa watershed and Guatemala City)</p> <p>10 – Basic weather stations</p> <p>Design of automated flood warning system for the Río Polochic including concept of operation procedures</p> <p>Postgraduate training for operational meteorologists and hydrologists (training began in June 2000 and will run for 15 months)</p> <p>Installation, maintenance, operation and data quality control training for meteorological</p>

Table 4. Program Schedule

Installation, Operational or Implementation Date	Activity
By 30 September 2000	<p>systems</p> <p>Meteorologist training at the International Forecasting Desk in Washington</p> <p>Operation training for PC base station hardware and software for automatic weather stations</p>
By 31 March 2001	<p>2 – Automatic Weather Stations (sites to be determined)</p> <p>2 – Automatic precipitation stations on southern volcanoes</p> <p>Office personal computers</p> <p>Development of national strategic implementation plan</p> <p>Spare parts and test equipment, as needed</p> <p>Meteorologist training at the International Forecasting Desk in Washington (2nd trainee)</p> <p>Installation, maintenance, operation and data quality control training for meteorological systems (newly installed)</p> <p>Operation training for PC base station hardware and software for automatic weather stations (newly installed)</p> <p>Beginning of meteorological technician advanced training (if implemented)</p>
By 30 June 2001	<p>1 – Complete flood forecasting system for the Río Polochic including all communications links and field monitor installations; includes final concept of operation definition</p> <p>Operation training of PC base station hardware and software for flood warning and forecast system</p> <p>Hydrologic forecast training using software</p>

Table 4. Program Schedule	
Installation, Operational or Implementation Date	Activity
	for the flood warning system
By 31 December 2001	Emergency maintenance on NWS-installed systems Complete maintenance and operation training for all NWS-systems

B. Budget

The NWS budget for the first and second phases of the Guatemala program follows the budget outlined in the Interagency Agreement (IAA) between the Department of Commerce and USAID. Detailed activity budgets will be developed in conjunction with selected contractors to ensure adherence to the IAA trached budgets. The budget breakdown is shown in Table 5.

Table 5. Program Budget					
Problem Area	Activities	Description	Problem Area Budget through 30 September 2000	Problem Area Budget 1 October 2000 – 31 December 2001	Total Problem Area Budget
Base Infrastructure Reconstruction	Reconstruct and Improve Hydro-meteorological Data Collection Network	<p>5 – Automatic Weather Stations</p> <p>7 – Radios (base stations and VHF radios)</p> <p>1 – Repeater station</p> <p>10 – Basic weather stations</p> <p>1 – Set of spares and test equipment</p> <p>2 – Office personal computers</p> <p>Emergency maintenance, as needed</p>	\$230,000	\$170,000	\$400,000

Table 5. Program Budget					
Problem Area	Activities	Description	Problem Area Budget through 30 September 2000	Problem Area Budget 1 October 2000 – 31 December 2001	Total Problem Area Budget
Forecast and Early Warning Systems	Implementation of community-based flood warning system	Flood forecasting system for the Río Polochic (including field equip.)	\$175,000	\$490,000	\$665,000
	Flood warning system	2 – Automatic precipitation stations on southern volcanoes			
	National Strategic Implementation Plan	Development of strategic plans			
	Training and Capacity Building	2 – Students for post graduate training			
		2 – Students for training on the International Desk			
		Installation, maintenance, operation, and data quality control			

Table 5. Program Budget					
Problem Area	Activities	Description	Problem Area Budget through 30 September 2000	Problem Area Budget 1 October 2000 – 31 December 2001	Total Problem Area Budget
		training for field monitoring systems			
Disaster Preparedness and Response	Training and Capacity Building	<p>Development of concept of operation procedures for flood early warning system</p> <p>Operation training of PC base station hardware and software for field monitoring equipment and flood early warning system</p> <p>Hydrologic forecast training for flood warning system</p> <p>Advanced training for meteorological technician (tentative)</p>	\$45,000	\$60,000	\$105,000

